PROCEEDINGS OF THE FIRST ANNUAL MEETING OF THE AMERICAN INSTITUTE OF NUTRITION

NEW YORK HOSPITAL—CORNELL MEDICAL COLLEGE ASSOCIATION, NEW YORK CITY, MARCH 28, 1934

MINUTES OF MEETING OF AMERICAN INSTITUTE OF NUTRITION, NEW YORK CITY, MARCH 28, 1934

The first annual meeting of the enlarged American Institute of Nutrition was held in New York City at Cornell Medical Center on March 28, 1934, as per program mailed to members. Seventy members registered as in attendance and 110 guests were registered. As a matter of fact, a considerably larger number of both members and non-members were in attendance but the others did not register.

President Lafayette B. Mendel presided at the scientific and business sessions. The meeting started promptly on time, at 9.30 A.M.; the business session started promptly at 11.30 and closed exactly at 1.00 P.M. The second scientific session also started promptly on time, and closed a little before 5.00 P.M. All the papers listed for reading, except one, were heard, namely paper no. 8 in the afternoon program, by Israel S. Kleiner and Henry Tauber. This was read by title at the authors' request.

A photograph of the meeting was taken at the afternoon session.

The business session was called to order by President Mendel. The minutes of the organization meeting in Cincinnati were read by the secretary and approved.

The president requested the secretary to announce the names of any members who had died during the past year. The secretary announced that only one, so far as he was aware,

had died, namely Dr. Alfred F. Hess of New York City. The members were asked to rise for a moment in token of respect for Doctor Hess.

First in order was the constitution which had been passed upon at a meeting of the committee appointed last year, which was held at Columbia University Faculty House, Tuesday evening, March 27th, Doctors Mendel, Murlin and Macy only being present. In anticipation of the adoption of the constitution the president asked unanimous consent for the appointment of a nominating committee to report nominations for officers and members of the council not later than 12.45. On motion of Dr. W. C. Rose, the president was given authority to name this nominating committee by unanimous vote. The committee named, consisted of Dr. P. E. Howe, chairman; Dr. Helen Parsons, Dr. W. C. Rose, Dr. L. H. Newburgh and Dr. E. M. Nelson.

The proposed constitution and by-laws were then read slowly section by section by the secretary, but at the chairman's request no action was taken on separate sections. Instead, the president requested that the Society approve his proposal that a committee on revision of the constitution be appointed to report next year. The advisability of this plan would be that all members would have an opportunity to study the constitution, after it was printed and placed in their hands, and they could then communicate with members of the committee on constitution, making such proposal for improvement or amendment as they might see fit.

The constitution and by-laws follow:

CONSTITUTION

1. The name of the proposed society is the "American Institute of Nutrition."

2. The purposes of the society are to further the extension of the knowledge of nutrition and to facilitate personal contact between investigators in nutrition and closely related fields of interest.

3. The management of the American Institute of Nutrition shall be vested in a council consisting of the President, Vice-President, Secretary, Treasurer and three additional members.

BY-LAWS

Article I—*Membership*

Section 1. *Eligibility for Membership*: Qualified investigators who have independently conducted and published meritorious original investigations in some phase of the chemistry or physiology of nutrition shall be eligible for membership in the Society.

Section 2. *Nomination*: Nominations for membership shall be made and seconded by members of the Society on blanks furnished by the Secretary. Nominations shall be submitted to the Council who shall determine eligibility and make recommendation to the Society at a regular meeting.

Section 3. *Election to Membership*: *A*. A nominee for membership may be voted for by ballot at any meeting of the Society after the Council has reported its findings on his eligibility. *B*. A majority of the ballots cast shall elect.

Section 4. *Forfeiture*: If a majority of the Council after due notice to the member in question and opportunity for a hearing, shall decide that the interests of the Society require the expulsion of a member, the Secretary shall send a notice of this decision to each member at least two weeks before the next annual meeting. At this meeting the Secretary shall, on behalf of the Council, propose the expulsion; and if two-thirds of the members present vote for it, the member shall be expelled, his assessment for the current year shall be returned to him, and he shall cease to be a member of the Society.

Article II—*Meetings and Quorum*

Section 1. *Annual*: The annual meeting of the Society shall be held on the date fixed by the Certificate of Incorporation.

Section 2. *Special*: A special meeting may be called at any time by the President, or in case of his absence or disability, by the Vice-President, and must be called at the request in writing of a majority of the Council or fifteen members of the Society. Notice specifying the purpose of such meeting shall be mailed to each member at least ten days previous thereto. The Council shall select the places at which meetings shall be held.

Section 3. *Quorum*: Fifteen members shall constitute a quorum at all meetings of the Society, but in absence of a quorum any number shall be sufficient to adjourn to a fixed date.

Article III—*Officials*

Section 1. *Officers*: The officers shall be a President, a Vice-President, a Secretary, and a Treasurer, who shall be elected annually by the members of the Society. Their terms of office shall commence with the close of the annual meeting at which they are elected.

Section 2. *Council*: The officers so selected and three additional members, one of whom shall be elected at each annual meeting to serve a term of three years, shall constitute a Board of Trustees and shall be known as "The Council." (When this provision is first put into effect one member shall be elected for one year, one for two years and the third for three years.)

Section 3. *Duties of Officers*: The powers and duties of the officers elected by the Society shall be such as usually devolve upon their respective positions.

Article IV—*The Council*

Section 1. *Powers*: The general management of the Society during the intervals between meetings shall be vested in the Council, which shall regularly perform the ordinary duties of an executive committee and possess all the powers conferred upon the Board of Trustees of an educational institution chartered by the Education Department of the University of the State of New York. A provisional charter was issued to the American Institute of Nutrition under date of September 27, 1928.

Section 2. *Reports*: The Council shall report to the Society its findings on the eligibility of candidates for membership, and on all charges of a violation of these By-Laws.

Article V—*Nominating Committee*

Section 1. *Membership*: *A.* The Nominating Committee shall consist of five members appointed for the coming year by the retiring President. Members who have served on the Nominating Committee for two consecutive years shall be ineligible for reappointment until after a lapse of one year. *B.* The President shall designate one member to be Chairman of the Nominating Committee.

Section 2. *Nomination of Officials*: *A.* The Nominating Committee shall make at least one nomination for each of the four offices and for each of the additional positions in the Council to be filled by vote of the members. *B.* The nominations by the Nominating Committee must be transmitted to the Secretary at least one month before the annual meeting at which they are to be considered. *C.* The Secretary shall send to every member, at least two weeks before the annual meeting, the list of nominees presented to him by the Nominating Committee and at the same time shall notify all the members that they may vote by proxy or by mail. *D.* Additional nominations for the officers and for membership in the Council may be made by any member at the opening of the first executive session of any annual meeting.

Section 3. *Election of Officials*: *A.* The Secretary shall receive and present to the tellers, appointed by the President to take charge of the election, all signed ballots forwarded by absent members. *B.* All elective officials shall be selected by ballot at the close of the first executive session of each annual meeting. *C.* A majority of the votes cast shall be necessary to elect an official.

Section 4. *Filling of Vacancies*: *A.* The Nominating Committee shall fill all vacancies in elective positions except such as may occur at a meeting of the Society. *B.* The President of the Society shall fill all vacancies in appointive positions.

Article VI—*Financial*

Section 1. *Dues*: Annual assessments shall be determined by majority vote at the annual meetings, upon the recommendation of the Council, and shall be due within a month after the annual meeting.

Section 2. *Expenditures*: No expenditures from the general funds of the Society except those required in the performance of the ordinary official duties shall be made except by vote of the Society or the Council.

Section 3. *Penalty for non-payment of Dues*: *A*. Members in arrears for dues for two consecutive years shall forfeit their membership. *B*. Delinquent members may be reinstated by the Council provided all indebtedness to the Society is liquidated.

Article VII—*The Journal of Nutrition*

Section 1. The American Institute of Nutrition designates The Journal of Nutrition as its official organ of publication.

Section 2. In accordance with the expressed wish of The Wistar Institute of Anatomy and Biology, owner and publisher of The Journal of Nutrition, the American Institute of Nutrition shall nominate members of the Editorial Board for its official organ. *A*. Three members of this Institute shall be nominated as members of the Editorial Board each year to serve a term of four years, replacing three retiring members. *B*. Retiring editors shall not be eligible for renomination until one year after their retirement. *C*. The managing editor shall be chosen by the Editorial Board to serve a period of five years.

Article VIII—*Papers on Scientific Subjects*

Section 1. The Secretary shall be authorized to arrange programs for the scientific sessions at the annual meetings.

Article IX—*Changes in Constitution and By-Laws*

Section 1. Proposed changes in the Constitution and By-Laws must be sent in writing to the Secretary at least one month before the date of the meeting at which they are to be considered, and must be signed by at least three members. The Secretary shall send a printed copy of any proposed change to each member at least two weeks before the next meeting and shall notify all members that they may vote by proxy.

Section 2. If at this meeting two-thirds of the votes cast shall favor the proposed change, it shall be made.

Adopted
March 28, 1934

LAFAYETTE B. MENDEL, *Chairman*
PAUL E. HOWE
MARY S. ROSE
ICIE G. MACY
JOHN R. MURLIN

After the reading of the constitution, on motion by Doctor Howe the constitution and by-laws were adopted by unanimous vote. As a committee to consider such revisions as might seem to be in order, the president appointed Dr. Paul E. Howe, chairman; Dr. M. S. Rose, Dr. Icie G. Macy, Dr. A. W. Rowe and Dr. J. R. Murlin.

The financial report of the secretary-treasurer next was read and accepted. An auditing committee, consisting of Dr. W. M. Sperry and Dr. A. H. Smith, previously appointed by the president, found the financial statement correct.

The council which had met at Columbia University Faculty House on Tuesday evening May 27th, reported the following names as qualified for membership in the American Institute of Nutrition:

	Sponsored by	
William H. Adolph	L. B. Mendel	A. H. Smith
Franklin Church Bing	V. C. Meyers	L. B. Mendel
Norman R. Blatherwick	L. B. Mendel	John R. Murlin
John B. Brown	F. A. Hitchcock	J. F. Lyman
David L. Drabkin	D. Wright Wilson	Jas. H. Jones
N. R. Ellis	Paul E. Howe	Edward B. Meigs
Wendell H. Griffith	H. B. Lewis	L. H. Newburgh
Helen A. Hunscher	Icie G. Macy	Lydia J. Roberts
Cornelia Kennedy	Leroy S. Palmer	R. Adams Dutcher
David M. Kydd	John P. Peters	L. B. Mendel
Alvin R. Lamb	Victor E. Nelson	B. H. Thomas
Floyd Heaton Lashmet	L. H. Newburgh	Eugene F. DuBois
Coral A. Lilly	L. H. Newburgh	H. B. Lewis
C. N. H. Long	W. C. Stadie	D. Wright Wilson
P. Mabel Nelson	Pearl P. Swanson	B. H. Thomas
L. C. Norris	W. E. Krauss	Roland M. Bethke
Roe E. Remington	Harold Levine	A. H. Smith
William Thomas Salter	Joseph C. Aub	Alfred T. Shohl
Raymond W. Swift	E. B. Forbes	John R. Murlin
Vincent du Vigneaud	John R. Murlin	Harold B. Pierce

It was moved by Doctor Howe, seconded by Doctor Carpenter, that the secretary cast one ballot in favor of the twenty candidates approved by the council. The motion was carried unanimously, and the secretary declared all elected.

The question of the relation of the American Institute of Nutrition to the Federation of American Societies for Experimental Biology was raised by the president, who stated that in the judgment of the council it would be premature to discuss this matter further at the present meeting. It seemed to him, as to other members of the council, that the present Federation Council was not yet ready to act favorably on the proposal that the institute become a constituent society of the Federation, which was made at the Cincinnati meeting, and in his judgment the American Institute of Nutrition should not be placed in the attitude of supplicants on this proposal. The secretary had been instructed by the council to find out informally whether there was any objection on the part of the Federation officials to the arrangement carried out this year, namely holding the meeting of the American Institute of Nutrition one day in advance of the Federation meeting. (The secretary met with the Federation council in the evening of March 28th and had the explicit assurance from all members of the Federation council, that there was no objection to this arrangement.)

The committee on nomination of officers reported names for the four offices and three members of the council, as provided in the constitution, as follows: President, John R. Murlin; Vice-President, E. F. DuBois; Secretary, Icie G. Macy; Treasurer, W. M. Boothby; members of the council, 1-year term, Agnes Fay Morgan; 2-year term, A. H. Smith; 3-year term, R. M. Bethke. On motion of Dr. Victor Myers and seconded simultaneously by several individuals whose names were not obtained, the secretary was instructed to cast one ballot for the entire slate. The secretary called attention to the fact that this would be embarrassing in view of the fact that his own name appeared on the ballot, and Doctor Mendel therefore volunteered to act as secretary in carrying out the spirit of this motion. He declared all nominees elected.

The dues for 1934–1935 were fixed at $1.00 by unanimous vote of the Institute.

The question of a permanent charter for the Institute was raised, and the secretary was instructed to place this item on the agenda for the business session next year. Meantime the terms of permanent incorporation were to be investigated by the president-elect.

In accordance with the by-laws just adopted, the chairman named as a nominating committee for 1935 Dr. H. Steenbock, chairman; Dr. E. B. Forbes, Dr. A. W. Rowe, Dr. W. M. Sperry and Dr. Helen Mitchell.

It was announced that the place and date of the next meeting would be determined by the council just elected.

The Institute adjourned at 5.00 o'clock with a rising vote of thanks to the New York Hospital and Cornell Medical Center for the splendid accommodations provided for this meeting, and especially to the local committee for all they had done in the interest of comfort and convenience for the members and their guests.

JOHN R. MURLIN,
Secretary-Treasurer.

PROGRAM OF PAPERS PRESENTED

ABSTRACTS

The absorption and storage of vitamin A by the rat. Carl A. Baumann (by invitation), Blanche M. Rising (by invitation), and Harry Steenbock, Department of Agricultural Chemistry, University of Wisconsin, Madison.

When vitamin A in the form of halibut liver oil was fed to rats the amount of vitamin A stored in the livers was found to parallel the amount of vitamin A in the diet, but only 10 to 20 per cent of the ingested vitamin A, as measured by the $SbCl_3$ test, was recovered from this organ. Much of the vitamin was destroyed in the digestive tract, but all of the losses could not be attributed to this destruction.

The growth of rats on a low A diet was greater than could be explained by their stores of vitamin A in the liver. Vitamin A reserves were depleted at the rate of 13 blue units a day on a low A diet. The minimum daily dose of vitamin A necessary to produce storage in the liver was 25 blue units. Nevertheless, animals whose liver reserves averaged only 25 blue units grew for 5 weeks and survived for 10 weeks on a vitamin A free diet. Attempts to locate adequate amounts of vitamin A in tissues other than the livers failed.

When equal amounts of halibut oil were fed to normal and to low A rats, the liver stores increased most rapidly in the normal animals. Evidently tissues other than the liver exert a pronounced effect not only upon the storage but upon the depletion of vitamin A reserves.

Disturbance in the water metabolism of albino rats induced by feeding a ration poor in inorganic constituents. Pearl P. Swanson and Arthur H. Smith, Nutrition Laboratory of the Foods and Nutrition Department, Iowa State College, Ames, and the Department of Physiological Chemistry, Yale University, New Haven.

Complete withdrawal of inorganic constituents from an otherwise adequate experimental diet causes a disturbance in water metabolism of the albino rat. This is shown by abnormal distribution of water in certain tissues (blood, muscle, kidney, and bone), by retardation of processes of natural dehydration associated with advancing age, and by augmented water intake and urine output.

The adjustment of the experimental animal (37 days old) to the low salt ration is of special significance. After 42 days, a dehydration of muscle occurs, greater than that attributed to advancing age. This condition is reflected in more hydremic blood. After the 90-day experimental period, however, both muscle and blood of these animals contain more water than do the same tissues in normal animals. It is in this latter period that the water intake and the urine output increase markedly.

Associated with dehydration characteristic of the muscle after 42 days are changes in fresh weight of the adrenal gland. During this period, the normal organ increases 35 per cent in weight; the adrenal of the 'low salt animal,' 56 per cent. After this there is a progressive shrinking of the adrenal concomitant with increased and sustained water content of muscle and blood. It appears that certain compensatory changes in size of adrenal occur related to shifts in distribution of water in blood and muscle.

The utilization of energy producing nutriment and protein as affected by individual nutrient deficiencies. I. The effects of cystine deficiency. R. W. Swift (by invitation), O. J. Kahlenberg (by invitation) and E. B. Forbes, Institute of Animal Nutrition, Pennsylvania State College.

Twenty growing rats were fed, by the paired feeding method, in metabolism, growth and body analysis experiments, ten on a cystine deficient diet and ten on the same diet plus cystine. The diets were of the same energy value and were fed in identical quantities to the two rats of each pair.

The effects of cystine deficiency were depression of appetite, growth, and storage of nitrogen and energy; there was increased energy loss as heat, and as urine and feces, but no effect on digestibility of protein.

The relation of the leucines to nutrition. Madelyn Womack (by invitation) and William C. Rose, Laboratory of Physiological Chemistry, University of Illinois, Urbana.

By the use of diets devoid of proteins, but carrying instead synthetic mixtures of highly purified amino acids supplemented with concentrates of our unknown growth essential,[1] it has been demonstrated that both leucine and isoleucine are indispensable dietary components. In the absence of either from the ration young rats cease to grow. On the other hand, the addition of the missing amino acid to the food promptly induces growth.

The relation of norleucine to nutrition is still uncertain. Under conditions similar to those described above, its removal from the food exerts no effect upon body weight. If it is a necessary dietary constituent, the quantities required are extremely small.

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[1] Windus, W., Catherwood, F. L., and Rose, W. C., J. Biol. Chem., 94, 173 (1931).

On the relation between the melting point and absorption of fats. L. Emmett Holt, Jr., Herbert C. Tidwell (by invitation) and Sarah Neale (by invitation), Harriet Lane Home of the Johns Hopkins Hospital and the Department of Pediatrics, Johns Hopkins University, Baltimore, Maryland.

The melting point is commonly believed to be an important factor in the absorption of fat, low melting fats being more readily absorbed.

In metabolism experiments on infants we observed the best retention: 1) with fats containing a predominance of shorter chain fatty acids, 2) those with a predominance of unsaturated fatty acids. Both these fats are characterized by low melting points, but it occurred to us that ease of absorption might be due to the peculiarity of chemical constitution rather than to the low melting point. We recently had an opportunity to test this point.

Glycerides of elaidic acid, though isomeric with oleic and containing also a double bond, nevertheless melt at a far higher temperature. By comparing a partially hydrogenated corn oil, rich in elaidin, with a mixture of tripalmitin and tristearin (approximately 2:1) we were able to study two fats of practically identical melting point (50°C.) which differed greatly in their content of unsaturated fatty acid. A striking difference in retention was found. With the

completely saturated tripalmitin-tristearin mixture the average retention was only 61.5 per cent of the intake, whereas with the partially hydrogenated corn oil containing the elaidin 81 to 84 per cent was retained.

The results indicate that the chemical constitution of the fat (in this case the presence of double bonds) rather than the melting point is the important factor in fat absorption.

A hitherto undescribed disturbance of calcium metabolism. R. H. Freyberg (by invitation), R. L. Grant (by invitation) and L. H. Newburgh, University of Michigan Medical School, Ann Arbor.

The calcium, phosphorus and energy exchange was studied in a 19-year-old male exhibiting generalized skeletal demineralization, obesity, hypertension and hyposexualism. Serum calcium was high, serum phosphorus low and serum phosphatase high—findings typical of hyperparathyroidism.

When the diet was poor in calcium, the urinary calcium was high, and the calcium balance was markedly negative. When the diet contained abundant calcium, the urinary calcium did not change significantly, the fecal calcium became very high, and the balance remained negative. Intravenously injected calcium was partially excreted in the urine, the remainder retained. When the high calcium diet was supplemented by $CaHPO_4$, the urinary calcium was not changed significantly, the fecal calcium was markedly increased, and the balance became only slightly positive. The calcium balance was not significantly changed when viosterol and haliver oil were administered. Administration of NH_4Cl was attended by a marked increase in urinary calcium, no change in fecal calcium, and negative calcium balance. Yeast did not change the urinary calcium; however, the fecal calcium diminished, and the calcium balance became more positive than at any other time. Further study of this yeast effect is now under way.

The phosphorus exchange took the same course as that of the calcium.

Undernutrition caused weight loss which followed the prediction for normals.

The effect of the previous diet on the basal respiratory quotient and oxygen consumption. F. A. Hitchcock, Department of Physiology, Ohio State University, Columbus.

The increasing use of the respiratory quotient in studies on the metabolism of the various food stuffs makes desirable a more complete knowledge of the normal variations to which it is subject and of the various factors affecting it. The experiments reported here were carried out to determine what effect, if any, the composition of the diet on the day preceding a basal metabolism test has on the R.Q. and oxygen consumption.

Nine men and two women were used as subjects. Control tests were run on each subject in which there was no attempt made to control the diet. The basal metabolism was then determined after each subject had consumed for one or more days preceding the test, 1) a diet rich in carbohydrates, 2) one rich in fats, and 3) one rich in proteins.

In spite of considerable personal variation the results show that the quotients were appreciably higher after the high carbohydrate diet, while the lowest quotients were obtained after the subject had been on a high fat diet. The high

protein diet also seemed to produce a lowering of the quotient. With a majority of the subjects the lowest oxygen consumption was obtained after the high carbohydrate diet. Analysis of the data shows the extreme susceptibility of the quotient to changes in the ventilation rate. There is also an indication that the factor of fatigue plays an important part in fixing the level of both the R.Q. and the oxygen consumption.

On the measurement of body heat losses. James D. Hardy (introduced by Eugene F. DuBois), Russell Sage Institute of Pathology, in affiliation with the New York Hospital, and the Department of Medicine, Cornell University Medical College, New York.

The development of an accurate method for measuring skin temperature and body radiation has permitted investigations of the heat losses of the body in detail. The radiation losses, under the standard conditions for measurement of the basal metabolic rate in the Sage Calorimeter, have been found to be 55 per cent of the total heat eliminated, convection 20 per cent and vaporization 25 per cent.

Radiation and skin temperature measurements have been made under various atmospheric conditions on normal subjects fully clothed and half clothed. A new method for obtaining the average skin temperature has been developed which weighs the readings according to the surface area of the part examined.

The appearance of cataract and dermatitis in experimental animals given vitamin G deficient diets containing casein and egg albumin. Paul L. Day, William C. Langston (by invitation) and K. W. Cosgrove (by invitation), University of Arkansas School of Medicine, Little Rock.

Comparisons were made between the pathological manifestations produced by vitamin G poor diets containing casein and egg albumin as the sources of protein. Albino rats given a vitamin G deficient diet, containing casein, developed alopecia and cataract, but dermatitis (other than alopecia) appeared only rarely. When dried egg albumin was substituted for the casein, a dermatitis developed, similar to that described by Parsons, but the animals did not show any significant cataractous changes. Chicks given the Ringrose-Norris-Heuser diet E, which contains casein as the source of protein, developed keratitis and cataract, but only mild dermatitis. Chicks given the Ringrose-Norris-Heuser diet F, which contains egg albumin, developed severe dermal lesions, but only slight changes in the cornea and lens. It appears that egg albumin tended to prevent the appearance of cataract, but was a causative factor in the development of dermatitis, in both rats and chicks.

Further investigations concerning the new vitamin B rat growth factor found in whole wheat. Nellie Halliday and Linnea Dennett (by invitation), Michigan Agricultural Experiment Station, Home Economics Section, East Lansing, Michigan.

We have reported the presence in whole wheat of a factor which apparently supplements vitamins B and G for the rat. In its absence growth ceases and certain typical nerve symptoms (very similar to those due to vitamin B_4 deficiency) manifest themselves.

Using a technic which will induce this condition, we have been able to test various materials for their potency in this factor. It is found to be largely concentrated in the outer layers of the grain. It can be extracted by dilute acid or by 50 per cent alcohol, but apparently not by ether. Using bran as the source material, and following in the main the method described by the English workers for vitamin B_1, we have prepared an active concentrate which resembles in many respects crystalline vitamin B_1.

Since the nerve condition can be alleviated and growth be induced by materials which are very low in vitamin B_1 and, since the animals are at all times receiving vitamin G in amounts considered to be adequate, it would seem that the deficiency cannot be due to a lack of either of these two known vitamins, but is probably due to a third factor. This may or may not be vitamin B_1, but there are some characteristics common to both factors.

The vitamin C content of human and guinea pig tissues. C. G. King, Chemistry Department, University of Pittsburgh.

Using the titration technic previously described by Bessey and King (J. Biol. Chem., 103, 687), a further study has been made of the rate of depletion of vitamin C from the tissues of guinea pigs with known dietary histories. Depletion follows rapidly and regularly with a scorbutic diet. External indications of the depletion appear much later. The distribution of vitamin C in human tissues is analogous to that in guinea pigs, and has been found to show such marked variations for individuals that a wide zone of depletion appears to be fairly common without external evidence of a deficiency. This intermediate zone may be physiologically significant without being recognized by casual examination.

The effect of high and low cholesterol diets on growth and efficiency of food utilization in rats. Warren M. Sperry and V. A. Stoyanoff (by invitation), Chemical Laboratory, Babies' Hospital, and the Department of Biological Chemistry, College of Physicians and Surgeons, Columbia University, New York.

Rats were paired at weaning according to sex and in most cases according to litter. One member of each pair was fed a practically cholesterol free, synthetic diet (extracted casein, sugar, Crisco, and supplements); the other received the same diet plus 1 or 2 per cent cholesterol. The rats were weighed at frequent intervals and the total food consumption was determined. The data, which have been analyzed statistically, indicate that the rats receiving cholesterol grew less well and consumed less food than rats receiving no cholesterol. To determine whether the decreased growth was due only to decreased consumption of food, efficiency quotients were calculated according to the formula of Palmer and Kennedy.[1] The results indicate that the cholesterol-fed rats utilized their food less efficiently than rats receiving no cholesterol. The detrimental effect of cholesterol may possibly be due to the fact that it accumulates in large amounts in the liver. In a small series of rats on a natural-food diet, consisting chiefly of grains, no significant differences between rats receiving and not receiving cholesterol were observed.

[1] Palmer, L. S., and Kennedy, C., J. Biol. Chem., 90, 545 (1931). Digestion coefficients were not determined as the diet was the same for each of the groups being compared, except for the cholesterol, for which correction was made.

The influence of cholesterol on the tissues of rats ingesting diets rich and poor in fat. H. H. Williams (by invitation), W. E. Anderson and L. B. Mendel, Department of Physiological Chemistry, Yale University, New Haven.

The rations of all animals beginning at 21 days of age contained 40 per cent of the total calories as dried skimmed milk, the remaining 60 per cent of the energy intake being supplied by 1) cornstarch, 2) coconut oil, or 3) cottonseed oil. Part of the animals in each group received an addition of cholesterol (1 per cent) to their rations. A vitamin supplement of ether extracted yeast and cod liver oil concentrate was also supplied. When the rats had consumed the equivalent of 3000 calories, they were killed and the tissues were examined.

In the high fat diets the addition of cholesterol caused an increase of 20 to 30 per cent in weight of liver when calculated on a body weight basis. This increase was due, at least partly, to the deposition of neutral fat. No difference was obtained when cholesterol was added to the carbohydrate diet which contained approximately 1 per cent fat. Increases in cholesterol content paralleled the total lipid content, the ester fraction exhibiting the greater part of the change. Feeding cholesterol had no effect upon the cholesterol composition of the adrenals; however, these glands were noticeably heavier on the high fat diets. There is some evidence that the cholesterol additions to the high fat diets increased the cholesterol content of the blood plasma, particularly in the ester fraction.

The effect of supplementary iodine on the nutritive value of chick rations. Arthur D. Holmes, Madeleine G. Pigott (by invitation) and Wendell H. Packard (by invitation), Research Laboratories, The E. L. Patch Company, Boston.

Numerous investigations have supplied data which indicate that the incidence of human goiter varies with the iodine content of the soils of different localities. Less information is available concerning iodine deficiency in animals, but reports for pigs, sheep and other animals indicate that the same situation prevails. Poultry feeds consist largely of cereals and these are quite generally grown in localities reputed to have soils of low iodine content. Accordingly a study has been made to ascertain whether supplementary feeding of iodine enhances the nutritive value of chick rations. Iodine was added at four different levels to a high-grade commercial chick growing ration. The experimental and control rations were fed to five pens of Rhode Island Red chicks from hatching to 12 weeks of age. Data were collected concerning the growth of the chicks, their physical appearance, bone growth, hemoglobin content of blood, the consumption of mash, and the nutritive efficiency of the five mashes under consideration. The results obtained did not indicate that the addition of iodine materially enhanced the nutritive value of the basal ration.

Effects of growth hormone on protein metabolism. N. K. Schaffer (by invitation) and M. O. Lee, Harvard Medical School, Boston.

The administration of anterior pituitary growth hormone to rats over short periods of time was followed by decreases in the concentration of several non-protein nitrogenous constituents of liver, muscle and the whole carcass. The free

amino acids decreased from 5 to 12 per cent and bound (peptide) amino acids decreased from 10 to 24 per cent in liver, muscle and whole carcass. Changes in ammonia were insignificant. Urea plus ammonia decreased from 6 to 21 per cent in the whole carcass, from 20 to 50 per cent in the liver and about 22 per cent in muscle. In hypophysectomized rats there was found a tendency toward higher levels of free amino acids.

The metabolism of fructose. Joseph H. Roe, Department of Biochemistry, School of Medicine, George Washington University, Washington.

A specific colorimetric method for the determination of fructose in blood and urine, based upon the Seliwanoff reaction, has been developed. Proteins and other organic matter are removed with $ZnSO_4$ and NaOH. Filtrate is mixed with resorcinol, HCl, and alcohol, and warmed at 80°C. in a water bath for 10 minutes. Following its ingestion by rabbits fructose is found in portal blood in considerable quantities and in peripheral blood in much smaller quantities. Analysis of blood samples collected simultaneously from the portal and hepatic veins following fructose ingestion has shown a decrease in fructose and an increase in the total fermentable sugar of the blood which passes through the liver, indicating the liver converts fructose into glucose. After enteral administration of fructose to chloroform poisoned rabbits the blood fructose level remains about the same as in normal animals, but a marked hyperglycemia occurs. This shows than in the damaged liver there is little impairment of the capacity to transform fructose to glucose but marked interference with the glycogenic function of the liver. Data have been obtained which indicate that fructose per se is not affected by insulin, but serves as an indirect physiological antagonist to insulin by its transformation into glucose in passing through the liver.

On the rate of absorption of D-glucose from the intestine of the dog. Harry C. Trimble, Biochemical Laboratory of Harvard Medical School, and Stephen J. Maddock, Laboratory of Surgical Research, Boston City Hospital, Boston. (Introduced by Milton O. Lee.)

In recent communications we have shown (A) that d-glucose is absorbed from the intact gastrointestinal tract of dogs at a rate approximating 1 gm. per kilo per hour,[1] and (B) that to this process the contribution of the stomach is either zero or negligibly small.[2] In order to test the possibility that the pylorus might prevent the absorption process proceeding at the maximum attainable rate a series of observations have been made upon unanaesthetized animals which received glucose directly into the small intestine. In twelve experiments (1 to 3 hours) the observed rates of absorption averaged 0.92 gm. per kilo per hour. Decreasing the period of observation or increasing the concentration of the administered solution did not yield evidence of higher rates.

[1] J. Biol. Chem., 100, 125, 1933.
[2] J. Biol. Chem., 103, 285, 1933.

protein diet also seemed to produce a lowering of the quotient. With a majority of the subjects the lowest oxygen consumption was obtained after the high carbohydrate diet. Analysis of the data shows the extreme susceptibility of the quotient to changes in the ventilation rate. There is also an indication that the factor of fatigue plays an important part in fixing the level of both the R.Q. and the oxygen consumption.

On the measurement of body heat losses. James D. Hardy (introduced by Eugene F. DuBois), Russell Sage Institute of Pathology, in affiliation with the New York Hospital, and the Department of Medicine, Cornell University Medical College, New York.

The development of an accurate method for measuring skin temperature and body radiation has permitted investigations of the heat losses of the body in detail. The radiation losses, under the standard conditions for measurement of the basal metabolic rate in the Sage Calorimeter, have been found to be 55 per cent of the total heat eliminated, convection 20 per cent and vaporization 25 per cent.

Radiation and skin temperature measurements have been made under various atmospheric conditions on normal subjects fully clothed and half clothed. A new method for obtaining the average skin temperature has been developed which weighs the readings according to the surface area of the part examined.

The appearance of cataract and dermatitis in experimental animals given vitamin G deficient diets containing casein and egg albumin. Paul L. Day, William C. Langston (by invitation) and K. W. Cosgrove (by invitation), University of Arkansas School of Medicine, Little Rock.

Comparisons were made between the pathological manifestations produced by vitamin G poor diets containing casein and egg albumin as the sources of protein. Albino rats given a vitamin G deficient diet, containing casein, developed alopecia and cataract, but dermatitis (other than alopecia) appeared only rarely. When dried egg albumin was substituted for the casein, a dermatitis developed, similar to that described by Parsons, but the animals did not show any significant cataractous changes. Chicks given the Ringrose-Norris-Heuser diet E, which contains casein as the source of protein, developed keratitis and cataract, but only mild dermatitis. Chicks given the Ringrose-Norris-Heuser diet F, which contains egg albumin, developed severe dermal lesions, but only slight changes in the cornea and lens. It appears that egg albumin tended to prevent the appearance of cataract, but was a causative factor in the development of dermatitis, in both rats and chicks.

Further investigations concerning the new vitamin B rat growth factor found in whole wheat. Nellie Halliday and Linnea Dennett (by invitation), Michigan Agricultural Experiment Station, Home Economics Section, East Lansing, Michigan.

We have reported the presence in whole wheat of a factor which apparently supplements vitamins B and G for the rat. In its absence growth ceases and certain typical nerve symptoms (very similar to those due to vitamin B_1 deficiency) manifest themselves.

Using a technic which will induce this condition, we have been able to test various materials for their potency in this factor. It is found to be largely concentrated in the outer layers of the grain. It can be extracted by dilute acid or by 50 per cent alcohol, but apparently not by ether. Using bran as the source material, and following in the main the method described by the English workers for vitamin B_4, we have prepared an active concentrate which resembles in many respects crystalline vitamin B_4.

Since the nerve condition can be alleviated and growth be induced by materials which are very low in vitamin B_1 and, since the animals are at all times receiving vitamin G in amounts considered to be adequate, it would seem that the deficiency cannot be due to a lack of either of these two known vitamins, but is probably due to a third factor. This may or may not be vitamin B_4, but there are some characteristics common to both factors.

The vitamin C content of human and guinea pig tissues. C. G. King, Chemistry Department, University of Pittsburgh.

Using the titration technic previously described by Bessey and King (J. Biol. Chem., 103, 687), a further study has been made of the rate of depletion of vitamin C from the tissues of guinea pigs with known dietary histories. Depletion follows rapidly and regularly with a scorbutic diet. External indications of the depletion appear much later. The distribution of vitamin C in human tissues is analogous to that in guinea pigs, and has been found to show such marked variations for individuals that a wide zone of depletion appears to be fairly common without external evidence of a deficiency. This intermediate zone may be physiologically significant without being recognized by casual examination.

The effect of high and low cholesterol diets on growth and efficiency of food utilization in rats. Warren M. Sperry and V. A. Stoyanoff (by invitation), Chemical Laboratory, Babies' Hospital, and the Department of Biological Chemistry, College of Physicians and Surgeons, Columbia University, New York.

Rats were paired at weaning according to sex and in most cases according to litter. One member of each pair was fed a practically cholesterol free, synthetic diet (extracted casein, sugar, Crisco, and supplements); the other received the same diet plus 1 or 2 per cent cholesterol. The rats were weighed at frequent intervals and the total food consumption was determined. The data, which have been analyzed statistically, indicate that the rats receiving cholesterol grew less well and consumed less food than rats receiving no cholesterol. To determine whether the decreased growth was due only to decreased consumption of food, efficiency quotients were calculated according to the formula of Palmer and Kennedy.[1] The results indicate that the cholesterol-fed rats utilized their food less efficiently than rats receiving no cholesterol. The detrimental effect of cholesterol may possibly be due to the fact that it accumulates in large amounts in the liver. In a small series of rats on a natural-food diet, consisting chiefly of grains, no significant differences between rats receiving and not receiving cholesterol were observed.

[1] Palmer, L. S., and Kennedy, C., J. Biol. Chem., 90, 545 (1931). Digestion coefficients were not determined as the diet was the same for each of the groups being compared, except for the cholesterol, for which correction was made.

The influence of cholesterol on the tissues of rats ingesting diets rich and poor in fat. H. H. Williams (by invitation), W. E. Anderson and L. B. Mendel, Department of Physiological Chemistry, Yale University, New Haven.

The rations of all animals beginning at 21 days of age contained 40 per cent of the total calories as dried skimmed milk, the remaining 60 per cent of the energy intake being supplied by 1) cornstarch, 2) coconut oil, or 3) cottonseed oil. Part of the animals in each group received an addition of cholesterol (1 per cent) to their rations. A vitamin supplement of ether extracted yeast and cod liver oil concentrate was also supplied. When the rats had consumed the equivalent of 3000 calories, they were killed and the tissues were examined.

In the high fat diets the addition of cholesterol caused an increase of 20 to 30 per cent in weight of liver when calculated on a body weight basis. This increase was due, at least partly, to the deposition of neutral fat. No difference was obtained when cholesterol was added to the carbohydrate diet which contained approximately 1 per cent fat. Increases in cholesterol content paralleled the total lipid content, the ester fraction exhibiting the greater part of the change. Feeding cholesterol had no effect upon the cholesterol composition of the adrenals; however, these glands were noticeably heavier on the high fat diets. There is some evidence that the cholesterol additions to the high fat diets increased the cholesterol content of the blood plasma, particularly in the ester fraction.

The effect of supplementary iodine on the nutritive value of chick rations. Arthur D. Holmes, Madeleine G. Pigott (by invitation) and Wendell H. Packard (by invitation), Research Laboratories, The E. L. Patch Company, Boston.

Numerous investigations have supplied data which indicate that the incidence of human goiter varies with the iodine content of the soils of different localities. Less information is available concerning iodine deficiency in animals, but reports for pigs, sheep and other animals indicate that the same situation prevails. Poultry feeds consist largely of cereals and these are quite generally grown in localities reputed to have soils of low iodine content. Accordingly a study has been made to ascertain whether supplementary feeding of iodine enhances the nutritive value of chick rations. Iodine was added at four different levels to a high-grade commercial chick growing ration. The experimental and control rations were fed to five pens of Rhode Island Red chicks from hatching to 12 weeks of age. Data were collected concerning the growth of the chicks, their physical appearance, bone growth, hemoglobin content of blood, the consumption of mash, and the nutritive efficiency of the five mashes under consideration. The results obtained did not indicate that the addition of iodine materially enhanced the nutritive value of the basal ration.

Effects of growth hormone on protein metabolism. N. K. Schaffer (by invitation) and M. O. Lee, Harvard Medical School, Boston.

The administration of anterior pituitary growth hormone to rats over short periods of time was followed by decreases in the concentration of several non-protein nitrogenous constituents of liver, muscle and the whole carcass. The free

amino acids decreased from 5 to 12 per cent and bound (peptide) amino acids decreased from 10 to 24 per cent in liver, muscle and whole carcass. Changes in ammonia were insignificant. Urea plus ammonia decreased from 6 to 21 per cent in the whole carcass, from 20 to 50 per cent in the liver and about 22 per cent in muscle. In hypophysectomized rats there was found a tendency toward higher levels of free amino acids.

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A specific colorimetric method for the determination of fructose in blood and urine, based upon the Seliwanoff reaction, has been developed. Proteins and other organic matter are removed with $ZnSO_4$ and NaOH. Filtrate is mixed with resorcinol, HCl, and alcohol, and warmed at 80°C. in a water bath for 10 minutes. Following its ingestion by rabbits fructose is found in portal blood in considerable quantities and in peripheral blood in much smaller quantities. Analysis of blood samples collected simultaneously from the portal and hepatic veins following fructose ingestion has shown a decrease in fructose and an increase in the total fermentable sugar of the blood which passes through the liver, indicating the liver converts fructose into glucose. After enteral administration of fructose to chloroform poisoned rabbits the blood fructose level remains about the same as in normal animals, but a marked hyperglycemia occurs. This shows than in the damaged liver there is little impairment of the capacity to transform fructose to glucose but marked interference with the glycogenic function of the liver. Data have been obtained which indicate that fructose per se is not affected by insulin, but serves as an indirect physiological antagonist to insulin by its transformation into glucose in passing through the liver.

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[1] J. Biol. Chem., 100, 125, 1933.
[2] J. Biol. Chem., 103, 285, 1933.

The carbohydrate exchange of the heart of depancreatized dogs. H. E. Himwich and W. Goldfarb (by invitation), Laboratory of Physiology, Yale University School of Medicine, New Haven.

Previous work discloses that not only glucose but also lactic acid[1, 2, 3] is removed by the heart of normal dogs. The carbohydrate exchange of this organ is therefore normally positive. In the present experiments the carbohydrate exchange of the heart of depancreatized dogs has been studied. Either 48 or 72 hours after aseptic extirpation of the pancreas the animals were anaesthetized with amytal, artificial respiration was instituted and the thorax opened. Blood samples were drawn, practically simultaneously from the coronary sinus and the femoral artery and analyzed for lactic acid and glucose. The combined errors of the method were 6 mg. per cent. The results reveal that in fourteen of sixteen significant observations the carbohydrate exchange is positive. An increased glycogen content of the heart[4, 5] and a cardiac R.Q. indicating the combustion of fat[6, 7] suggest that lactic acid and glucose are converted to glycogen chiefly at the expense of the oxidation of fat, the diabetic condition of the animal precluding the adequate oxidation of carbohydrate.

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[1] Himwich, H. E., Koskoff, Y. D., and Nahum, L. H. 1928. Proc. Soc. Exp. Biol. Med., 25, 347.

[2] McGinty, D. A. 1931. Am. J. Physiol., 98, 244.

[3] Evans, C. L., DeGraff, A. C., Kosaka, T., Mackenzie, K., Murphy, G. E., Vacek, T., Williams, D. H., Young, F. G. 1933. J. Physiol., 80, 21.

[4] Cruickshank, E. W. H. 1914. J. Physiol., 47, 1.

[5] Chambers, W. H., Kennard, M. A., Pollack, H., Dann, M. 1932. J. Biol. Chem., 97, 525.

[6] Piserico, E. 1925. Arch. Fisiol., 23, 488.

[7] Cruickshank, E. W. H., and Startup, C. W. 1933. J. Physiol., 80, 179.

READ BY TITLE

The digestion of salivary amylase by trypsin and by papaine. Israel S. Kleiner and Henry Tauber (by invitation), Department of Physiology and Physiological Chemistry, New York Homeopathic Medical College and Flower Hospital, New York.

In studies on the chemical nature of enzymes we have had occasion to test the digestibility of urease, maltase, rennin, emulsin, pepsin and trypsin. With the single exception of emulsin, all of these, under certain conditions, may be digested by proteolytic enzymes, some of them very rapidly. We have now tested salivary amylase and can report that it is slowly inactivated by trypsin and more slowly by H_2S—activated papaine.

A comparison of the antirachitic potency of cod liver oil and irradiated ergosterol on a curative and preventive basis. Walter C. Russell, M. W. Taylor (by invitation) and D. E. Wilcox (by invitation), Department of Agricultural Biochemistry, New Jersey Agricultural Experiment Station, New Brunswick, New Jersey.

When cod liver oil and irradiated ergosterol are compared as to their prevention of leg weakness in the chicken, the amounts fed are expressed in units of vitamin

D determined by a curative method, using the white rat as the assay animal. In the chicken an amount of irradiated ergosterol antirachitically equivalent to cod liver oil, according to a curative rat assay, is not as effective in the prevention of leg weakness as cod liver oil. In order to determine whether the white rat responded equally well to the same number of units of the factor in the form of cod liver oil and irradiated ergosterol, when fed on a preventive basis for 40 days, the two sources of the factor were fed at 0.5, 1, 2, and 10 times the curative (Steenbock) unit per 50 gm. of ration. Practically identical bone ash percentages were obtained at each of these levels. This result is in striking contrast to that observed in the case of the chicken.

Chemical composition and breaking strength of bones of rats consuming a ration extremely poor in inorganic salts. Miriam F. Clarke (by invitation), A. L. Bassin (by invitation) and Arthur H. Smith, Departments of Physiological Chemistry and of Surgery, Yale University, School of Medicine, New Haven.

It has been shown that bone ash is greatly reduced and fragility increased when rats are fed diets containing minimal amounts of inorganic residue. In the present investigation chemical changes occurring in the femur and breaking strength of fibula, radius and humerus were studied. These factors were examined in animals kept on the low salt diet for 3, 6 or 12 weeks, as well as for others treated in a similar fashion but subsequently realimented with adequate diet for varying periods.

Ash, based on weight of dry, extracted femur, was reduced to 44, 42 and 40 per cent after 3, 6 and 12 weeks, respectively, on the low salt diet; values for corresponding age controls were 57, 61 and 64 per cent.

After 3 weeks on the low salt ration, moisture of the femur rose to 57 per cent whereas the control value at this age was 48 per cent.

Realimentation resulted in a return to normal chemical composition when the period on the low salt diet had been short (3 weeks), but a failure to reestablish normal composition when the period was long (12 weeks).

The breaking strength of the bones was reduced to values less than half of those of the controls. Realimentation resulted in a tendency toward over compensation, followed by a relative decrease to values somewhat less than those of the controls.

The possibility of gluconeogenesis from fat. IV. Non-effect of a high fat meal on the combustion of sugars in human subjects. John R. Murlin, Alan C. Burton (by invitation), Edmund S. Nasset (by invitation) and Sidney Feyder (by invitation), Department of Vital Economics, University of Rochester, Rochester, N. Y.

By means of a semi-automatic respiration calorimeter with closed circuit and the Tissot-Haldane method, the respiratory metabolism and heat production of three subjects subsisting exclusively for 3 days on rich cream were studied. The ketonuria and ketonaemia were followed by analysis for the two fractions diacetic acid + acetone and beta hydroxybutyric acid. Calorimeter periods were introduced on the second and third high fat days; on the former in basal condition, on the latter following a high fat meal. The specific dynamic action therefore

was determined, by simultaneous direct and indirect calorimetry, supplemented by the Tissot-Haldane method. Direct and indirect heat agreed except in one subject, unaccustomed to fat, in whom the R.Q's were very low. Approximately 3½ hours after the high fat meal on the third day and next morning (fourth day) without previous food, a large dose of sugar was taken. The assumption was made that if the fat meal had contributed anything to the carbohydrate stores of the body, the sugar would have been oxidized more rapidly than when it was taken post-absorptively. No such effect was obtained. It seems, therefore, the high fat contributed no carbohydrate at this particular time, or for some reason it had not yet become available for combustion.

Studies in lactation. II. Application of criteria of growth in the suckling young to estimation of lactation in the rat. Ray G. Daggs, Department of Vital Economics, University of Rochester, Rochester, N. Y.

Brody's growth measurement method was applied to the growth of suckling young rats. One growth constant was obtained for the period from the fourth to the tenth day of life and another for the period from the tenth to the seventeenth day. The litters were all limited to six young at birth. At about 4 days the habits of the mother become stabilized and on about the sixteenth or seventeenth day the eyes of the young open and they begin to nibble at the mother's food. From a complete analysis of our data on lactation in rats we find in the majority of cases the distinct break at approximately the tenth day that Brody describes. The growth constants differ with a fair degree of significance when the diets of the lactating mothers differ. We believe this method is a more accurate picture of the growth changes in the young due to lactation changes in the mother than is presented by any of the existing means of judging lactation in rats such as percentage weight increase, percentage mortality, etc. It is frankly admitted that growth in suckling young depends upon many more factors than the quantity and quality of the milk supplied. Many of these other factors have been controlled in our experiments.

A study of the relation of diet to dental caries. Martha Koehne and R. W. Bunting (by invitation), in cooperation with Mary Crowley, Philip Jay and Dorothy G. Hard, University of Michigan School of Dentistry, Ann Arbor.

Report is made of the incidence of dental caries in a group of 169 children, 6 to 18 years old, who lived in an orphanage and who were under dental observation for periods varying from 1 to 4½ years. Policies followed in feeding the children for the past 5 or 6 years have been remarkably uniform and results of detailed studies of the food intake of sixteen representative children living under this regime are reported. Quantitative estimations of the concentration of B. acidophilus in the salvia of twenty-four children were made at monthly intervals for a period of a year and a half. Correlation is made of dental findings with the quality of food, concentration of B. acidophilus in the saliva, carbon dioxide capacity of the saliva, height-weight status of the children, and other factors studied.

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